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10/750,064

12/30/2003

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EXAMINER

BURD, KEVIN MICHAEL

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/750,064	Applicant(s) MALTSEV ET AL.	
	Examiner Kevin M. Burd	Art Unit 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 September 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6, 10-16 and 18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 10-16 and 18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

1. This office action, in response to the remarks filed 9/30/2008, is a final office action.

Response to Arguments

2. The declaration filed on 9/30/2008 under 37 CFR 1.131 has been considered but is ineffective to overcome the Sun reference.
3. The evidence submitted is insufficient to establish diligence from a date prior to the date of reduction to practice of the Sun reference to either a constructive reduction to practice or an actual reduction to practice. Exhibit A of the declaration is dated 2/28/2003. The instant application was filed on 12/30/2003. No evidence is submitted to establish diligence from 2/28/2003 to the constructive reduction to practice of filing the application on 12/30/2003.

For this reason and the reasons stated in the previous office action, the rejections of the claims are maintained and stated below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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4. Claims 1-3 and 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sun et al (US 2005/0152314) in view of Andre (WO 01/37474) further in view of Ebiko et al (WO 03/071712). Ebiko et al (US 2004/0161058) is a translation of Ebiko et al (WO 03/071712) and is referenced in the rejection stated below.

Regarding claim 1, Sun discloses an averaging circuit adapted to provide an averaged channel estimate by performing a time domain averaging and a frequency domain averaging on one or more received inputs (paragraph 0154). An equalizer equalizes a received multicarrier symbol based on the averaged channel estimate. The channel estimate H is used to calculate the equalization (paragraphs 0155-0160). Sun does not disclose a coarse channel estimator to receive a symbol replica and a received symbol to generate a coarse channel estimate. However, it is well known in the art of data communication that a received signal is equivalent to the transmitted signal and the distortion caused by the medium the transmitted signal travels through prior to being received. This fact is shown in figure 3a of Andre. The response H of a channel is equal to the received sequence divided by the known transmitted sequence in the frequency domain. This is further described in page 9, lines 11-21. The transfer function is the channel estimate. It would have been obvious for one of ordinary skill in the art at the time of the invention to combine the teachings of Andre into the apparatus of Sun to utilize the equation of $H(f) = R(f)/T(f)$ to determine a transfer function (channel estimate). The channel estimate is important to determine in a receiver since the distortion caused by the channel will degrade the received signal and may prevent the proper recovery of the transmitted signal. The combination discloses a known sequence is used to

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determine the channel response. The known sequence will be stored in the receiver.

The combination does not disclose the generation of a replica of the transmitted symbol.

Ebiko discloses a received sequence is input to a channel estimation section 120 (figure

1). The channel estimation section receives a replica of the received signal from the

equalizer 130 (abstract). The replica of the received signal is de-interleaved 140 and

decoded 150 to recover the originally transmitted symbol. This symbol is fed to the

channel estimation section 120 to determine the channel estimation. The channel

estimation receives a received symbol and the replica of the originally transmitted

symbol. It would have been obvious for one of ordinary skill in the art at the time of the

invention to include an adaptive equalizer in the apparatus. Instead of using a fixed

replica symbol and being required to transmit a known sequence to determine the

channel estimate, data is used to calculate the estimate. Therefore, the data rate of the

system is increased allowing more data to be transmitted in less time than before.

Regarding claim 2, Sun discloses the averaging circuit is adapted to provide an averaged channel estimate by performing time domain averaging and frequency domain averaging on one or more received channel estimates (paragraph 0154).

Regarding claim 3, Sun further discloses the averaging circuit comprises a time domain averaging block adapted to perform time domain averaging on a plurality of received channel estimates to generate a time domain averaged channel estimate on a per subcarrier basis (paragraphs 0154 and 0156). A frequency domain averaging block is adapted to perform frequency domain averaging on a received time domain averaged

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channel estimate (paragraph 0154). The time domain averaging is taken prior to the FFT and the frequency domain averaging is done after the FFT.

Regarding claim 10, Sun discloses the multicarrier symbol comprises an OFDM symbol (paragraph 0110).

Regarding claims 11 and 13, Sun discloses an averaging circuit adapted to provide an averaged channel estimate by performing a time domain averaging and a frequency domain averaging on one or more received inputs (paragraph 0154). An equalizer equalizes a received multicarrier symbol based on the averaged channel estimate. The channel estimate H is used to calculate the equalization (paragraphs 0155-0160). Sun discloses the equalizer comprises an adaptive equalizer (paragraph 0156). Sun does not disclose a coarse channel estimator to receive a symbol replica and a received symbol to generate a coarse channel estimate. However, it is well known in the art of data communication that a received signal is equivalent to the transmitted signal and the distortion caused by the medium the transmitted signal travels through prior to being received. This fact is shown in figure 3a of Andre. The response H of a channel is equal to the received sequence divided by the known transmitted sequence in the frequency domain. This is further described in page 9, lines 11-21. The transfer function is the channel estimate. It would have been obvious for one of ordinary skill in the art at the time of the invention to combine the teachings of Andre into the apparatus of Sun to utilize the equation of $H(f) = R(f)/T(f)$ to determine a transfer function (channel estimate). The channel estimate is important to determine in a receiver since the distortion cause by the channel will degrade the received signal and

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may prevent the proper recovery of the transmitted signal. Andre transmits a known sequence to determine the effect of the channel on the received data. The channel can be compensated for and data will be properly recovered. The combination does not disclose the generation of a replica of the transmitted symbol. Ebiko discloses a received sequence is input to a channel estimation section 120 (figure 1). The channel estimation section receives a replica of the received signal from the equalizer 130 (abstract). The replica of the received signal is de-interleaved 140 and decoded 150 to recover the originally transmitted symbol. This symbol is fed to the channel estimation section 120 to determine the channel estimation. The channel estimation receives a received symbol and the replica of the originally transmitted symbol. It would have been obvious for one of ordinary skill in the art at the time of the invention to include an adaptive equalizer in the apparatus. Instead of using a fixed replica symbol and being required to transmit a known sequence to determine the channel estimate, data is used to calculate the estimate. Therefore, the data rate of the system is increased allowing more data to be transmitted in less time than before.

Regarding claim 12, Sun discloses the averaging circuit is adapted to provide an averaged channel estimate by performing time domain averaging and frequency domain averaging on one or more received channel estimates (paragraph 0154).

Regarding claim 14, Sun discloses the multicarrier symbol comprises an OFDM symbol (paragraph 0110).

5. Claims 4, 15, 16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sun et al (US 2005/0152314) in view of Andre (WO 01/37474) further in view of Ebiko et al (WO 03/071712) further in view of Kim et al (US 2004/0125235).

Regarding claim 4, the combination of Sun, Andre and Ebiko discloses the apparatus stated above in paragraph 4. The combination does not disclose the frequency domain averaging block generates frequency domain averaged channel estimates that are used to update coefficients of the equalizer. Kim discloses using channel estimates to update coefficients of the equalizer (paragraph 0021) to reduce channel distortion (paragraph 0021). For this reason, it would have been obvious for one of ordinary skill in the art at the time of the invention to combine the coefficient update of Kim into the apparatus of the combination of Sun, Andre and Ebiko.

Regarding claims 15 and 16, Sun discloses an averaging circuit adapted to provide an averaged channel estimate by performing a time domain averaging and a frequency domain averaging on one or more received inputs (paragraph 0154). An equalizer equalizes a received multicarrier symbol based on the averaged channel estimate. The channel estimate H is used to calculate the equalization (paragraphs 0155-0160). Sun does not disclose a coarse channel estimator to receive a symbol replica and a received symbol to generate a coarse channel estimate. However, it is well known in the art of data communication that a received signal is equivalent to the transmitted signal and the distortion caused by the medium the transmitted signal travels through prior to being received. This fact is shown in figure 3a of Andre. The response H of a channel is equal to the received sequence divided by the known

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transmitted sequence in the frequency domain. This is further described in page 9, lines 11-21. The transfer function is the channel estimate. It would have been obvious for one of ordinary skill in the art at the time of the invention to combine the teachings of Andre into the apparatus of Sun to utilize the equation of $H(f) = R(f)/T(f)$ to determine a transfer function (channel estimate). The channel estimate is important to determine in a receiver since the distortion cause by the channel will degrade the received signal and may prevent the proper recovery of the transmitted signal. The combination discloses a known sequence is used to determine the channel response. The known sequence will be stored in the receiver. The combination does not disclose the generation of a replica of the transmitted symbol. Ebiko discloses a received sequence is input to a channel estimation section 120 (figure 1). The channel estimation section receives a replica of the received signal from the equalizer 130 (abstract). The replica of the received signal is de-interleaved 140 and decoded 150 to recover the originally transmitted symbol. This symbol is fed to the channel estimation section 120 to determine the channel estimation. The channel estimation received a received symbol and the replica of the originally transmitted symbol. It would have been obvious for one of ordinary skill in the art at the time of the invention to include an adaptive equalizer in the apparatus. Instead of using a fixed replica symbol and being required to transmit a known sequence to determine the channel estimate, data is used to calculate the estimate. Therefore, the data rate of the system is increased allowing more data to be transmitted in less time than before. The combination of Sun, Andre and Ebiko does not disclose the frequency domain averaging block generates frequency domain averaged channel estimates that

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are used to update coefficients of the equalizer. Kim discloses using channel estimates to update coefficients of the equalizer (paragraph 0021) to reduce channel distortion (paragraph 0021). For this reason, it would have been obvious for one of ordinary skill in the art at the time of the invention to combine the coefficient update of Kim into the apparatus of the combination of Sun, Andre and Ebiko.

Regarding claim 18, Sun discloses an averaging circuit adapted to provide an averaged channel estimate by performing a time domain averaging and a frequency domain averaging on one or more received inputs (paragraph 0154). An equalizer equalizes a received multicarrier symbol based on the averaged channel estimate. The channel estimate H is used to calculate the equalization (paragraphs 0155-0160). Sun does not disclose a coarse channel estimator to receive a symbol replica and a received symbol to generate a coarse channel estimate. However, it is well known in the art of data communication that a received signal is equivalent to the transmitted signal and the distortion caused by the medium the transmitted signal travels through prior to being received. This fact is shown in figure 3a of Andre. The response H of a channel is equal to the received sequence divided by the known transmitted sequence in the frequency domain. This is further described in page 9, lines 11-21. The transfer function is the channel estimate. It would have been obvious for one of ordinary skill in the art at the time of the invention to combine the teachings of Andre into the apparatus of Sun to utilize the equation of $H(f) = R(f)/T(f)$ to determine a transfer function (channel estimate). The channel estimate is important to determine in a receiver since the distortion caused by the channel will degrade the received signal and may prevent the proper recovery of

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the transmitted signal. Andre transmits a known sequence to determine the effect of the channel on the received data. The channel can be compensated for and data will be properly recovered. The combination does not disclose the generation of a replica of the transmitted symbol. Ebiko discloses a received sequence is input to a channel estimation section 120 (figure 1). The channel estimation section receives a replica of the received signal from the equalizer 130 (abstract). The replica of the received signal is de-interleaved 140 and decoded 150 to recover the originally transmitted symbol. This symbol is fed to the channel estimation section 120 to determine the channel estimation. The channel estimation receives a received symbol and the replica of the originally transmitted symbol. It would have been obvious for one of ordinary skill in the art at the time of the invention to include an adaptive equalizer in the apparatus. Instead of using a fixed replica symbol and being required to transmit a known sequence to determine the channel estimate, data is used to calculate the estimate. Therefore, the data rate of the system is increased allowing more data to be transmitted in less time than before. The combination of Sun, Andre and Ebiko does not disclose the frequency domain averaging block generates frequency domain averaged channel estimates that are used to update coefficients of the equalizer. Kim discloses using channel estimates to update coefficients of the equalizer (paragraph 0021) to reduce channel distortion (paragraph 0021). For this reason, it would have been obvious for one of ordinary skill in the art at the time of the invention to combine the coefficient update of Kim into the apparatus of the combination of Sun, Andre and Ebiko.

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6. Claims 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sun et al (US 2005/0152314) in view of Andre (WO 01/37474) further in view of Ebiko et al (WO 03/071712) further in view of Papathanasion (US 2004/0142665).

Regarding claim 5, the combination of Sun, Andre and Ebiko discloses the apparatus stated above in paragraph 4. The combination does not disclose the time domain averaging is performed using a moving average. Papathanasion discloses averaging using a moving average in paragraph 0042. Moving averaging is well known in the art for its ability to maintain a constant average value. For this reason, it would have been obvious for one of ordinary skill in the art at the time of the invention to combine the teaching of Papathanasion into the apparatus of the combination of Sun, Andre and Ebiko.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sun et al (US 2005/0152314) in view of Andre (WO 01/37474) further in view of Ebiko et al (WO 03/071712) further in view of Abeta et al (US 6,757,272).

Regarding claim 6, the combination of Sun, Andre and Ebiko discloses the apparatus stated above in paragraph 4. The combination does not disclose the time domain averaging is done by block averaging. Abeta discloses using block averaging (column 7, lines 57-67) since block averaging is computationally efficient since the average is not being constantly calculated. For this reason, it would have been obvious for one of ordinary skill in the art at the time of the invention to combine the block averaging of Abeta into the combination of Sun, Andre and Ebiko.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M. Burd whose telephone number is (571) 272-3008. The examiner can normally be reached on Monday - Friday 9 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David C. Payne can be reached on (571) 272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kevin M. Burd/
Primary Examiner, Art Unit 2611
10/28/2008